

Answer all questions below. You may use the available space for work, but must write ALL answers in the answer booklet. No cell phones, calculators, notes, or talking are allowed during the exam.

Name: _____ UID: _____

Tip: If you are stuck on a question, move on and come back to it later.

True or False

For #1-?? decide whether the statement is true or false. Write the word “True” or the word “False” on your answer sheet. Ambiguous answers will receive no credit. ($\frac{1}{2}$ point each.)

1. $\pi \in \mathbb{Q}$
2. $2.999 \in (0, 3)$
3. $\mathbb{Z} \subseteq \mathbb{N}$
4. $-x^3 + 17x^2 + 2x - 3$ has 5 roots.
5. -1 is a root of $2x^3 - 3x^2 - 7x - 2$.
6. $\sqrt[n]{x+y} = \sqrt[n]{x} + \sqrt[n]{y}$
7. $(x+y)^n = x^n + y^n$
8. $a(b+c) = ab+ac$
9. $\frac{a}{b} + \frac{c}{d} = \frac{a+c}{bd}$
10. 0 is always in the implied domain of $f(x) = \sqrt[n]{x}$.

Inverse Functions and n^{th} Roots

11. Solve for x : $\sqrt[4]{x+7} + 3 = 2$

12. If $f(x)$ is an invertible function and $f(14) = 7$, then what is $f^{-1}(7)$?

13. Find the inverse of $g(x) = (x + 3)^3$.

14. (2 points) What is the implied domain of $h(x) = \sqrt[12]{2x + 7} - 12$? Write your answer using interval notation.

Polynomials

15. Find the quotient: $\frac{4x^3 - 6x^2 - 20x + 8}{x^2 - 3}$

16. Find the quotient: $\frac{4x^3 - 5x + 6}{x - 2}$

17. What is the degree of the polynomial $p(x) = -2(x + 3)(x - 4)(x + 1)(x^2 + 1)(x^2 + 3)$?

18. What is the slope of the line in \mathbb{R}^2 that passes through the points $(1, 3)$ and $(-1, 2)$?

19. How many roots does $p(x) = 5x^2 - 2x - 1$ have?

20. Find all roots of $q(x) = -2x^2 + 5x + 1$. If there are no roots, write “none.”

21. Find a root of the polynomial $g(x) = -2x^3 + 11x^2 - 13x - 2$.

22. Complete the square: Write $-3x^2 + 6x + 7$ in the form $\alpha(x + \beta)^2 + \gamma$, where $\alpha, \beta, \gamma \in \mathbb{R}$.

Factoring Polynomials

For #??- ??, completely factor the following polynomials. Your answer should be a product of a constant and maybe some linear and quadratic polynomials that have leading coefficients equal to 1, such that any of the quadratics in the product have no roots.

23. Completely factor $10x + 5$.

24. Completely factor $2x^2 - 5x + 3$.

25. (2 points) Completely factor $4x^3 - 4x^2 - 20x - 12$, given that 3 is a root.

26. Write the following as a single fraction: $\frac{2x + \frac{5}{x^2}}{\frac{6x^4}{x} + \frac{5x}{x}}$

Graphing

27. The graph of a polynomial $p(x)$ is shown below. List all of the monic linear factors of $p(x)$.

Graph the following functions in the space provided in your answer booklet. Label any indicated information.

28. (2 points) $f(x) = 2(x - 2)^2 + 1$ (Label the vertex.)
29. (2 points) $g(x) = \sqrt{-x}$ (Label the y -intercept.)
30. (2 points) $h(x) = \sqrt[3]{x + 5}$ (Label the x -intercept.)
31. (2 points) $p(x) = -4x + 8$ (Label the x - and y -intercepts.)
32. (3 points) $q(x) = 3(x^2 - x + 1)(x - 2)^2(x + 5)$ (Label the x - and y -intercepts.)

33. (0 points) How are things going in the course? What is working well and what isn't?

You may use this space for scratchwork. This page will not be graded.

Name: _____ UID: _____

1. _____ 14. _____

2. _____ 15. _____

3. _____ 16. _____

4. _____ 17. _____

5. _____ 18. _____

6. _____ 19. _____

7. _____ 20. _____

8. _____ 21. _____

9. _____ 22. _____

10. _____ 23. _____

11. _____ 24. _____

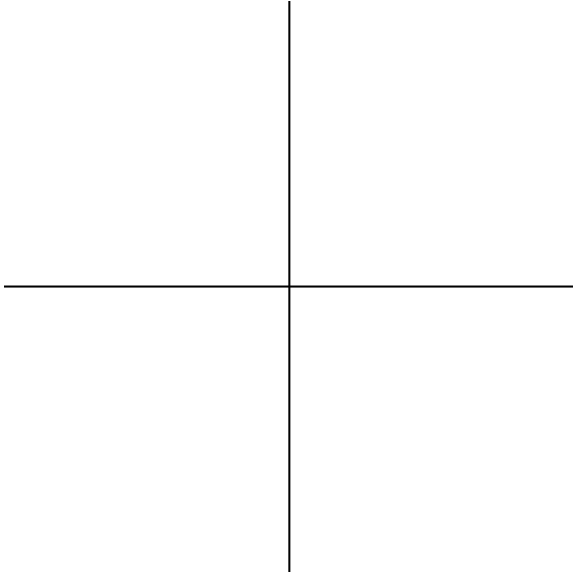
12. _____ 25. _____

13. _____ 26. _____

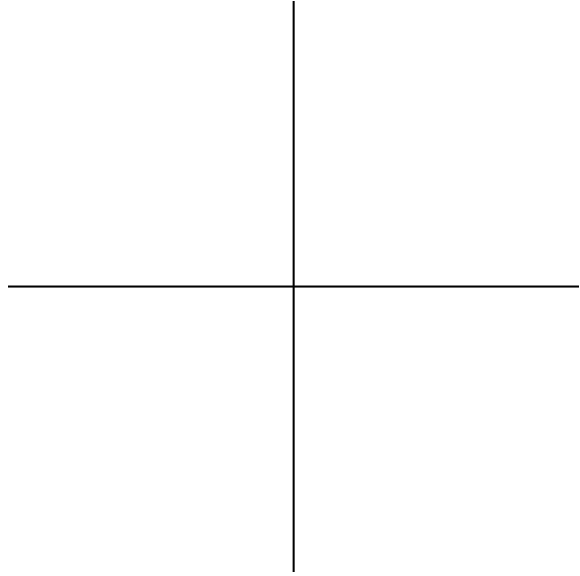
27. _____

Graph the following functions. Label any information listed in parenthesis.

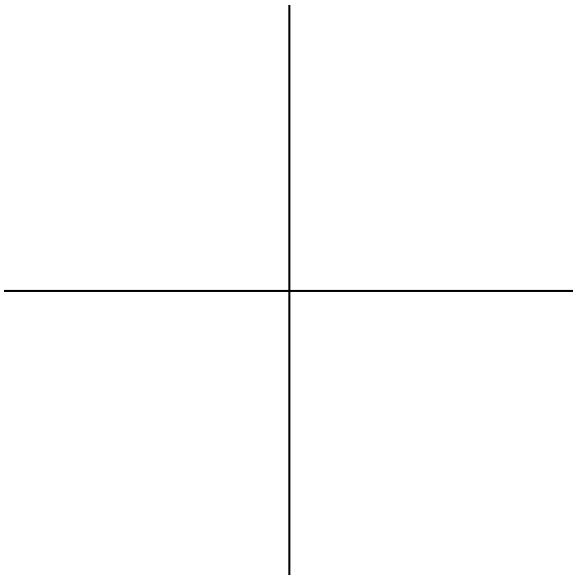
27. (2 points) $f(x) = 2(x - 2)^2 + 1$ (Label: vertex.)



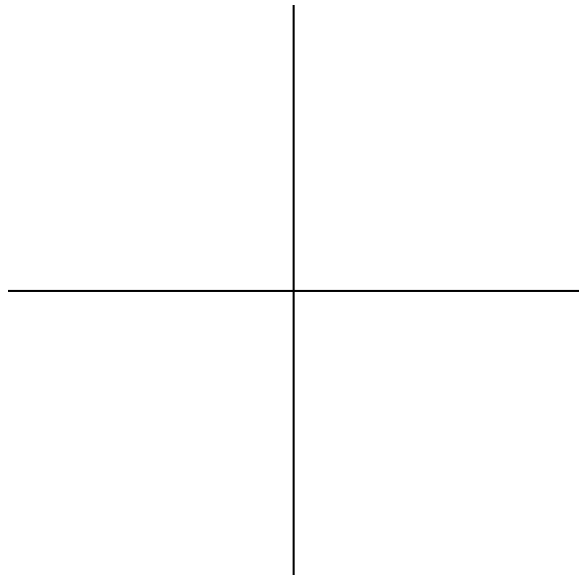
28. (2 points) $g(x) = \sqrt{-x}$ (Label: y -intercept.)



29. (2 points) $h(x) = \sqrt[3]{x + 5}$ (Label: x -intercept.)



30. (2 points) $p(x) = -4x + 8$ (Label: both intercepts.)



31. (3 points) $q(x) = 3(x^2 - x + 1)(x - 2)^2(x + 5)$ (Label: both intercepts.)

